

Futenvol: an innovative game for physical education students

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ABSTRACT

Teaching sports without sufficient equipment and facilities is a perennial challenge for physical educators in the Philippines. This study aimed to develop sports innovation targeting dual purpose of addressing facility scarcity while developing specific skill. This involved students (n=327) students enrolled in bachelor of physical education (BPEd) program and service physical education courses. Through a research and development design, the developmental process followed the analyze, design, develop, implement, and evaluate (ADDIE) model with the prime consideration of developing functional body coordination at the lower extremities such as ball control, kicking power, and kicking accuracy. These are vital for futsal and football with smaller play area requirement. The name *Futenvol* comes from the skills to be developed from futsal and football, while using the volleyball rotations and the rally of tennis, thus the coined name *Futenvol*. Repeated trial plays covering three iterative versions on court layout, game mechanics, and actual play resulted to the optimal version and showed that the innovation is highly acceptable. Above all, it is proven to develop flexibility and explosiveness in lower extremities that are basic skill-related components of fitness. The innovated game can be used as practice game while the exact court layout is not yet available thus greatly leveraging skills acquisition despite facility scarcity.

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1. INTRODUCTION

Sports advancements aim to improve the performance, safety, and enjoyment of both athletes and spectators. The field of sports innovation focuses on the application of new technologies and concepts within the sporting arena. This area has become increasingly significant in business research, resulting in a growing number of scholarly articles published in academic journals [1]. Futsal, a fast-paced, small-sided football game, emphasizes technical skill and high-pressure situations, offering benefits such as enhanced ball control, playing speed, teamwork, and tactical awareness [2]. Despite its rising popularity worldwide and official recognition by Union of European Football Associations (UEFA) and Fédération Internationale de Football Association (FIFA), it remains less globally appealing than traditional soccer. Tennis offers physical and mental health benefits for all ages yet faces challenges including gender pay disparity in major tournaments and issues related to the cost and availability of facilities. Similarly, volleyball encounters

obstacles related to facilities and equipment, as not all communities have easy access to courts and proper training resources, limiting opportunities for aspiring players. Although futsal, volleyball, and tennis present significant benefits, they often face challenges within the educational system. Silva *et al.* [3] study highlights issues such as limited accessibility, inadequate resources, and insufficient emphasis on these sports within school curricula.

Futenvol, a fusion of futsal, tennis, and volleyball, aims to bridge the gaps in accessibility while promoting physical activity. It combines the agility, precision, and strategic thinking of all three sports, offering a dynamic playing experience. The game is played on a modified court with zones for different types of play, encouraging players to develop versatile skills and adapt to varied mechanics. *Futenvol* addresses the challenges in physical education classes, providing a more inclusive and diverse approach to school sports by integrating elements from futsal, volleyball, and tennis.

The introduction of *Futenvol* into physical education curricula can help overcome accessibility and resource limitations found in traditional futsal, volleyball, and tennis. By combining key elements of these sports, schools can offer a more engaging and varied physical education experience. *Futenvol* not only addresses accessibility challenges but also fosters inclusivity, promoting a positive environment for students of all skill levels. Physical education should integrate cognitive, psychomotor, physical, social, and affective domains to instill the qualities and values outlined by Nolte and Roux [4].

Hence, this study aimed to develop a new innovative game by utilizing the analyze, design, develop, implement, and evaluate (ADDIE) model and assess the acceptability of the innovative game *Futenvol*, by understanding the perspectives of experts and students. Umar *et al.* [5] gave potential benefits and challenges associated with integrating these games into educational settings particularly in physical education subjects. This innovation does not only involve the cognitive and affective domains but also psychomotor, an important part of achieving learning goals in physical education. This means that motor skills that are present in this new innovative game are fundamental to achieving effective learning goals in physical education students and sports enthusiasts. We discovered that many studies have developed gamified versions using ADDIE [6]–[10], but our study can address literature gap since this is an innovative game intended not for gamified versions, but for physical education and sports activities.

This study used the ADDIE model phases to develop a new game. The steps include analysis, design, development, implementation, and evaluation. This sequence, however, does not require strict, linear, progression in the steps [11], [12]. This means that the movement from one stage to another is flexible, but the movement is strictly circular.

The ADDIE model shown in Figure 1 has a flexible structure that allows it to be applied to all learning environments [13], [14]. To better understand the use of the ADDIE model as the conceptual framework for this study, each essential step in the developmental ADDIE process, as presented by Gagne *et al.* [15] is described in the following paragraphs: the analysis phase can be seen as the “goal-setting stage.” During this phase, designers focus on identifying the target audience and matching the program to each student or participant’s individual skill and intelligence levels. The design phase includes creating learning objectives, assessment tools, exercises, content selection, subject matter analysis, lesson planning, and media choices. In the development phase, developers compile and create content assets generated in the design stage. The implementation stage involves ongoing adjustments to ensure maximum efficiency and positive outcomes are achieved. Lastly, in the evaluation stage of the ADDIE method-an acronym for a framework of interlinking steps in instructional design-meticulous final testing is conducted to assess what was accomplished (or not), as well as how, why, when things were completed throughout the project.

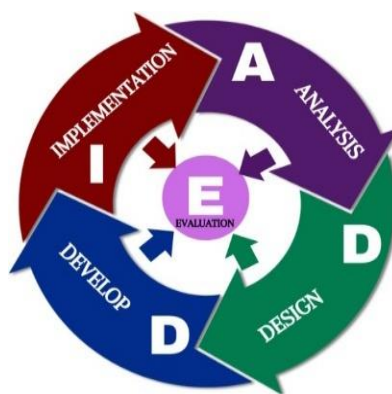


Figure 1. ADDIE model

2. METHOD

In this study, the ADDIE model a descriptive quantitative and qualitative research design was applied [16]. The quantitative research design was used to collect data using the research-made questionnaire. The qualitative research design was utilized for the demographic profile and the level of acceptability of the game. Descriptive design made room for the concepts and issues to assess by the researcher. The ADDIE model is an instructional design model that has withstood the test of time and use. It is simply a “device” that is meant as a guideline to create effective training and instructional materials [17].

2.1. Participants

The research participants in this study consist of local and international field experts in futsal, tennis, and volleyball who were essential in validating the sports innovation. A minimum of five experts were involved, with the responsibility of reviewing the ground rules, endorsing, and certifying that the innovative game is ready for play. The criteria for inclusion of these experts were as follows: they must have been players in futsal, tennis, or volleyball for a minimum of three years; they must have competitive experience at the local, regional, national, and/or international levels; they must have at least one year of coaching experience; and they must have at least one year of officiating experience.

Furthermore, students enrolled in the bachelor of physical education (BPED) program and service physical education courses PED011 and PED013 at Mindanao State University-General Santos City participated by performing the developed game and evaluating its acceptability. The criteria for these students included enrollment in the BPED program, PED011 (pathfit1: movement competency training (MCT)), or PED013 (pathfit3: choice of individual, dual sports, traditional games, recreational games, dance, and martial arts) during the first semester of the academic year 2023-2024.

2.2. Procedure

The ADDIE model consists of five stages used to develop training-support tools: analysis, design, development, implementation, and evaluation [18]. Initially, this process aimed to enhance the quality and efficiency of education and training by aligning instruction with job requirements and focusing on the most performance-critical areas [19]. It was verified and checked first by the adviser after which, the design was also submitted to experts in the sports field for comments and suggestions. The researcher integrated all the suggestions and recommendations into the design and then improved it through the development phase. The development phase consists of creating and organizing the actual learning material that will be used during instruction [20]. Pilot tests were performed where course materials and instructional methods are rehearsed. Feedback from these pilot tests helped identify weaknesses and enhance the entire program before implementation. Once the rules and mechanics of the game are approved by the field of experts and pilot testing through playing the innovative game *Futenvol*, this will be played by the student-respondents (N=327). After each version of games, the researcher surveyed the student respondents to identify the acceptability of the game. The researcher used a researcher-made survey questionnaire about the acceptability of the innovative game.

2.3. Data collection and analysis

The response will be analyzed using the statistical tools included in descriptive statistics. The information that will be gathered will be tabulated and processed manually and with a computer to determine the precise interpretation of the result. Data will be collated, tabulated, and analyzed. The following statistical tools will be used in the analysis of data are frequency distribution, mean, and for the qualitative data, the thematic analysis will be applied. Thematic analysis requires researchers to select from a wide variety of approaches that might differ significantly in their fundamental (albeit frequently implicit) conceptualizations of qualitative research, the creation of meaningful knowledge, important constructs like themes, and analytical techniques [21].

3. RESULTS AND DISCUSSION

3.1. Analysis stage

Despite the potential benefits offered by futsal, volleyball and tennis, challenges exist in the educational system. Issues identified in the study of House *et al.* [22] include the lack of accessibility, limited resources, and lack of emphasis on these sports in school curriculum. In the analysis stage, (n=327) physical education students participated in the survey. Based on the Table 1, overall analysis of the innovation game *Futenvol* got a general weighted mean of 4.36 which means respondents strongly agreed on indicators presented. Result corresponds to the study of Furtado *et al.* [23] in the innovative active-play games that, as people become more involved and successful with active-play games, they develop the skills that make it

easier to engage in physical activity. The result gives high implication that a possible integration of this innovative game to our curricula in physical education could make the classes enjoyable and that can lead to a lifelong interest in physical activity [24]. By creating a hybrid sport that combines the best elements of both games, schools can offer students a more varied and engaging physical education experience.

Table 1. Acceptability in terms of ADDIE of innovation game *Futenvol* (n=327)

Indicators	Mean	Remarks
Analysis	4.36	Strongly agree
Design	4.21	Strongly agree
Development	4.28	Strongly agree
Implementation	4.32	Strongly agree
Evaluation	4.34	Strongly agree

Scale: 1.00-1.80=strongly disagree; 1.81-2.60=disagree; 2.61-3.40=fairly agree; 3.41-4.20=agree; and 4.21-5.00=strongly agree.

3.2. Design stage

The designed layout of the *Futenvol* court shown in Figure 2, has a dimension of 78 ft long and 36 ft wide rectangular court, consisting of two goal posts at both ends. The longer border lines are called sidelines, and the shorter ones are called end lines (where the goalposts are situated in the middle). It was played in 4 vs 4 with specific roles in keeping, striking, and defending as displayed in Figure 3. The ball equipment used in this version is similar to soccer standard ball 310-330 g and a circumference of 64.5-66.5 cm. The keeper's role, in this context, becomes crucial as it focuses on executing the service effectively and strategically. By ensuring that every team member has the chance to serve, *Futenvol* encourages a collaborative and inclusive playing environment.

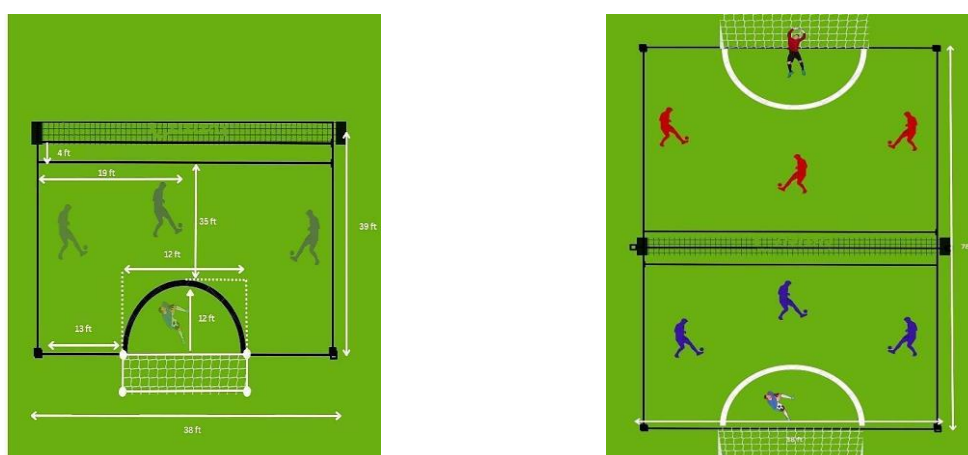


Figure 2. Layout of the *Futenvol* court



Figure 3. Positioning and composition of *Futenvol*

Moreover, Figure 4 shows the detailed overview of *Futenvol* rotation, the rotation is also similar to volleyball in that everyone on the team was given a chance to serve. Keepers role only highlights the service

role, it is important to note that the rotation system in *Futenvol* emphasizes equal opportunities for all team members to serve. This not only promotes fairness and equality within the team, but also allows each player to develop and showcase their serving skills.

In Figure 5, rally bounce rule, three bounce rally rules give emphasis to the uniqueness of the innovative game play and encourages players to strategize their moves carefully. This rule adds an extra layer of excitement and unpredictability to the game, keeping players on their toes and making every rally a thrilling experience. Additionally, the three-bounce rally rule also promotes longer rallies, showcasing their skills and agility as they chase down each shot. This rule contributes to the dynamic and fast-paced nature, for a more competitive game play. The ball is in play upon service, players are only allowed to touch the ball before and after the ball lands with a maximum of three bounces rule. Three bounces rule restarts in every player's touch. Each team's side can strike at any time. Players can make unlimited ground or aerial passes, if it does not exceed the possession time limit.

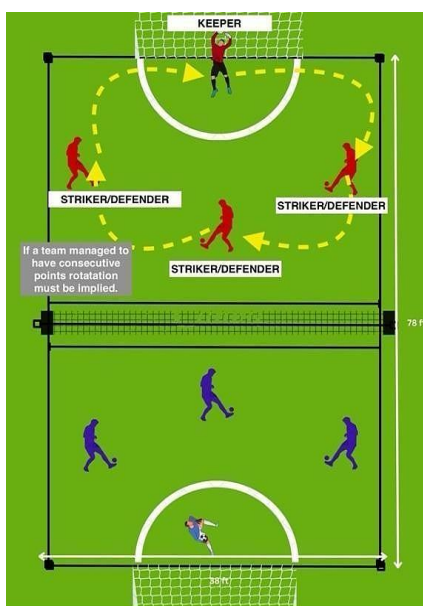


Figure 4. Rotation of *Futenvol* players



Figure 5. Three-bounce rally rules

Moreover, the design of innovation game *Futenvol* is supported by the research of Merritt and Clauset [25] entitled “Scoring dynamics across professional team sports: tempo, balance and predictability”, it investigates the scoring dynamics of professional team sports. The study found that the scoring dynamics of these sports exhibit common empirical patterns, and the competitive processes that produce these patterns are governed by fundamental processes. The study’s implications extend to the potential evolution of game strategies, making it a significant contribution to the field of sports analytics and game development.

The expert content validation results in Table 2 showcase a highly positive assessment of the study, with the highest mean of 4.64 indicating strong presentation that there is no duplication and redundancy, ensuring the uniqueness and quality of the mechanics and rules of the Innovative game *Futenvol*. The slightly lower mean of 4.3 for “The instrument covers the variables of the study” suggests a need for nuanced refinement to ensure comprehensive coverage of study variables. However, the robust overall mean of 4.45, signaling a strong agreement across indicators, reflects well-designed and relevant mechanics of the new Innovative game *Futenvol*.

The content validators are composed of national and international experts in the field of futsal, volleyball and tennis as shown in Table 3. Content validity is the extent to which a scale measures what it is intended to measure and measures all of the pertinent factors of a construct as defined by Oliveira *et al.* [26], these positive results enhance the research’s credibility, highlighting areas for potential improvement while affirming the study’s overall quality and validity.

Table 2. Presents the content validation of innovation game *Futenvol* (n=9)

Indicators	Mean	Remarks
There is no duplication and redundancy.	4.64	Strongly agree
The scale used is appropriate for the study.	4.6	Strongly agree
The instructions are clear and adequate.	4.45	Strongly agree
The items are relevant to the objective of the study.	4.44	Strongly agree
The items are clearly stated and understandable.	4.36	Strongly agree
Wording within the level of understanding of the respondents.	4.36	Strongly agree
The instrument covers the variables of the study.	4.3	Strongly agree
Overall	4.45	Strongly agree

Scale: 1.00-1.80=strongly disagree; 1.81-2.60=disagree; 2.61-3.40=fairly agree; 3.41-4.20= agree; and 4.21-5.00=strongly agree.

Table 3. Shows the profile of the content validators of innovative game *Futenvol*

Validator	Country	Affiliation
Validator 1	Thailand	Kasetsart University, Thailand
Validator 2	China	Maharakham University, Thailand
Validator 3	Singapore	Nanyang Technological University, Singapore
Validator 4	Philippines	Mindanao State University-Iligan Institute of Technology
Validator 5	Philippines	Mindanao State University-Iligan Institute of Technology
Validator 6	Philippines	Mindanao State University-General Santos City
Validator 7	Philippines	Mindanao State University-Iligan Institute of Technology
Validator 8	Malaysia	University of Putra Malaysia
Validator 9	Philippines	Mindanao State University, General Santos City

3.3. Development stage

Futenvol has seen significant progress through its three different versions. The incorporation of recommendations from content validators and the research panel has led to the crafting of effective mechanics and rules for the game. It has been shown that the final version of *Futenvol* introduces a unique playing style with specific rules and scoring mechanisms, bringing a fresh and innovative approach to the game. With its emphasis on ball control, scoring points, and fault penalties, *Futenvol* offers an exciting and dynamic experience for players and spectators alike. We found out that as the game continues to evolve, it holds the potential to become a popular and engaging sport in the future.

A game of *Futenvol* consists of 2 goal posts on both end lines of the 78×36 feet court. A player must score a goal. It can be played in a four-on-four match format, where two teams consist of four players, and compete against each other. The objective of the game is to score points by making a goal equivalent to 3 points or the opposing player commits a fault or error in receiving the ball which is equivalent to 1 point. Faults include failing to return the ball, hitting the ball into the net or out of bounds, and handball violations of the players.

According to the study, Terrien *et al.* [27] found that sports scenarios offer suitable settings for examining the interaction between individuals and physical equipment, particularly when participants are striving to enhance their performance. In this study it reinforces the idea that utilizing suitable equipment in sports is essential to enhance performance, maintain safety, comply with regulations, and offer a positive overall experience for athletes. The interaction between individuals and their equipment in the pursuit of optimal

performance is a dynamic and evolving facet of games, continually influenced by advancements in technology and our growing understanding of human physiology. In totality, the development of innovation game *Futenvol* got a general weighted mean of 4.28 which suggests that respondents strongly agreed on indicators presented.

3.4. Implementation

Based on the participants' results of the survey, the data from Table 1 sheds light on the acceptability of *Futenvol*, particularly through the lens of implementation indicators. Notably, the result indicates a strong positive reception among participants. This high mean suggest that users not only feel motivated to engage actively with the game but also exhibit a willingness to embrace and incorporate new gaming mechanics. Furthermore, as the opportunity arises for people besides the course designers to now be involved in the course redesign process, the actual instructors of the course emerge as key players in its successful execution [28]. The nuanced analysis of these mean scores, coupled with the increased involvement of students and instructors, helps uncover specific strengths and potential areas for improvement in the implementation of *Futenvol*, offering actionable insights for further refinement and enhancement. In the study [29] entitled "Exergames experience in physical education: a review", within the framework of conventional physical education programs, the use of physical games as a teaching tool provides a fresh and creative approach. In addition to being engaging for students, this method of instruction meets their need for social and physical interaction during the learning process and, most importantly, plays a significant role in sustaining children's and adolescents' participation in sports and physical education [30].

3.5. Evaluation

Through an acceptability survey, the participants concurred on a high level of acceptance, with an overall mean score of 4.34, indicating a "strongly agree" response. Interviews were also conducted that resulted in the perceptions of the students on the innovative game (refer to Figure 6). Our result gives conclusive evidence of a keen interest in the game's details and a positive perception of its design and organization for skill competence. This implies that while participants highly value the game's informational content and design, there may be a slightly lower perceived necessity for continuous engagement. Overall, the consistently strong agreement across indicators reflects a positive reception of *Futenvol*, underlining its success in meeting objectives and engaging players effectively. The evaluation results highlight the success of *Futenvol* in achieving its objectives and effectively capturing the interest of the students. The strong agreement across all indicators underscores the game's high level of acceptability and positive reception, ultimately affirming its effectiveness in engaging the target audience. In addition, the evaluation phase strongly supports that such kick-focused innovative game, develops flexibility and explosiveness in lower extremities that are basic skill-related components of fitness.

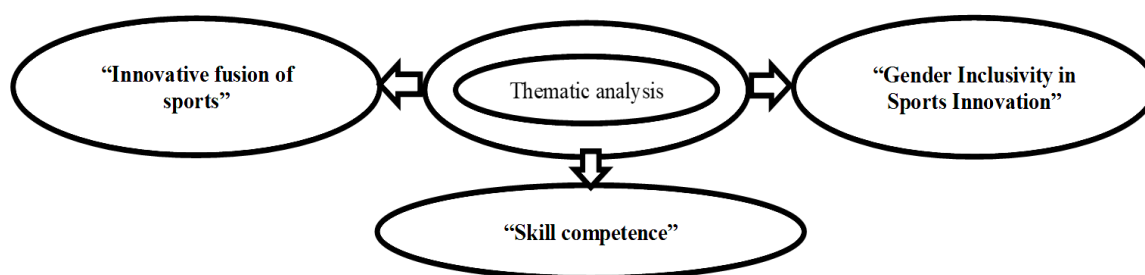


Figure 6. Illustrates the thematic analysis of the interview content

3.6. Thematic analysis

This section provides an academic thematic analysis of the students' responses obtained through interviews. This study evaluated the reception of the newly developed game, in line with its intended goals. By delving into the perspectives of the students, the analysis seeks to provide valuable insights into the acceptability and effectiveness of the game in meeting its intended objectives [31]. The study revealed three main themes: "innovative fusion of sports," "gender inclusivity in sports innovation," and "skill competence." These themes were further analyzed and categorized qualitatively. Employing both qualitative and quantitative designs provided comprehensive results of the acceptability and feedback on the innovation game *Futenvol*.

The thematic analysis uncovered insights into sports innovation, gender inclusivity, and skill competence, confirming the validity and acceptability of the game while also highlighting its potential for

addressing key issues in sports. The study has a strong implication of a positive impact in inclusive education not just only on gender issues but also in adaptive physical education. If research in this field continues to increase every year, it means that we support the implementation of inclusive education in the field of physical education, sports and health [32].

4. CONCLUSION

The results of this study affirmed the validity and high acceptability of the innovative game *Futenvol*, within the defined parameters of the study, specifically in physical education. Our findings also validate the effectiveness of the ADDIE model in identifying optimal processes in establishing innovative and creative games. Furthermore, three central themes surfaced from this study: sports innovation, gender inclusivity, and skill competence. These themes confirm the game's validity and acceptability while also highlighting its ability to address important issues in the world of sports. Additionally, it has been shown to enhance flexibility and explosiveness in the lower body, which are fundamental components of skill-related fitness. *Futenvol* introduces a dynamic playing field that allows for quick transitions between traditional tennis techniques and futsal-inspired footwork. The game will be played on a modified court with designated zones for different types of play, encouraging players to develop versatile skills and adapt to varied playing surfaces. *Futenvol* primarily emerges to address the challenges in physical education classes and aims to provide a more inclusive and diverse approach to physical activity in schools. By integrating the principles of futsal, volleyball, and tennis, *Futenvol* offers a unique opportunity for students to develop a wide range of skills in a single sport. This study is limited to the design and development of *Futenvol*, future research should conduct empirical testing to determine the viability of the innovation for improvement of the physical education curriculum. Nevertheless, the introduction of *Futenvol* into physical education curricula can potentially address the issues of accessibility and limited resources that traditional futsal, volleyball, and tennis encounter. The newly developed game significantly aiding skill acquisition despite limited facilities.

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Chiedel Joan San Diego	✓			✓		✓		✓		✓	✓			✓
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Griffter A. Sumando		✓				✓	✓		✓	✓				✓

C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

Futenvol: an innovative game for physical education students (Jay Carlo S. Bagayas)

ETHICAL APPROVAL

The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the authors' institutional review board MSU-IIT College of Education Research Ethics Committee.

DATA AVAILABILITY

The authors confirm that the data supporting the findings of this study are available within the article.

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